FISH 557
Estimation of Population Parameters

Instructor:	John R. Skalski (skalski@uw.edu)
Office Hours:	By appointment
Office Location:	FSH 264D; 1820 Puget Sound Plaza
Office Phone Number:	(206) 616-4851
Class Hours:	TTh 11:30 – 1:20 p.m.
Class Location:	FSH 213

Performance Evaluation:

Homework	9 Assignments	50 points each
Final (Due Tuesday, 15 March, 4:30 p.m.)		100 points

Grading:

Score	*Grade*
90%-Above	3.5-4.0
80%-90%	2.5-3.4
70%-79%	1.5-2.4

Prerequisites:

Calculus – MATH 124, 125 or QSCI 291, 292
Statistical Inference – QSCI 482, 483
Probability Theory – STAT 311 or STAT 341
Programming in Fortran, Basic, C, or C++, R

Policies:

Late homework – No credit unless prior permission

Computer Accounts:

Fisheries Computing Lab
Academic Computing Services

Textbooks:

Lecture Notes (Rams Copy Center, 4144 University Ave NE)
Edwards, A. W. F. 1992. Likelihood. Baltimore, MD: Johns Hopkins University Press.

Lecture Outline for FISH 557
Estimation of Population Parameters

Winter 2016 Skalski

Week 1 4 – 8 Jan.	a. Why parameter estimation? (Lecture 1) b. Review of probability distributions (Lecture 2) c. Expected values, variances, and covariances (Lecture 3) d. Delta method (Lecture 4)
Week 2 11 – 15 Jan.	a. Method of moments, maximum likelihood (Lecture 5) b. Difference equations, iterative solutions (Lecture 6) c. Bootstrap, jackknife techniques (Lecture 7) d. Least squares, nonlinear least squares (Lecture 8)
Week 3 18 – 22 Jan. Jan. 18 - Holiday	a. Bayesian estimation methods (Lecture 9) b. Single mark-recapture model (Lectures 10) c. Interval estimation, transformations (Lecture 11) d. Example of CWT analysis (Lecture 12)
Week 4 25 – 29 Jan.	a. Tag loss and error corrections (Lecture 13) b. Sampling precision, sample size calculations (Lecture 14) c. Estimating survival, sex ratios from age composition (Lecture 15) d. Structural models for estimating λ (Lecture 16)
Week 5 1 – 5 Feb.	a. Regression analysis of abundance (Lecture 17) b. Multiple recapture – Schnabel census (Lecture 18) c. Otis et al. (1978) models (Lecture 19) d. Jolly-Seber method (Lecture 20)
Week 6 8 – 12 Feb.	a. GLM modeling of capture histories (Lecture 21) b. Minimum sufficient statistic (Lecture 22) c. GLM analysis of mark-recapture data (Lab)
Week 7 15 – 19 Feb. 15 Feb. - Holiday	a. Estimating productivity (Lecture 23) a. Band-recovery models – Browning models (Lecture 24) b. Program USER (Lab)
Week 8 22 – 26 Feb.	a. Cormack (1964) release-recapture models (Lecture 25) b. Estimation of movement (Lecture 26) c. Multistate models (Lecture 27) d. Constant effort removal model (Lecture 28)

Week 9 29 Feb. – 4 Mar.	a. Variables effort methods – Leslie, DeLury (Lecture 29) b. Open population – Single-tag release (Lecture 30) c. Change-in-ratio methods (Lecture 31) d. Density estimation (Lecture 32)
Week 10 7 – 11 Mar.	a. Line-transect methods (Lecture 33) b. Catch-curve analysis (Lecture 34) c. Design of replicated release-recapture investigations (Lecture 35) d. Age-structured population reconstruction/stock assessment (Lecture 36)
15 Mar. 2016	Final due by 4:30 p.m.

Topic Outline for FISH 557
Estimation of Population Parameters

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1. Distribution of capture data
   a. Review of probability distributions
   b. Moments of random variables
   c. Delta method, Taylor series

2. Estimation techniques
   a. Method of moments
   b. Maximum likelihood estimation
   c. Least squares, weighted, and nonlinear least squares
   d. Bootstrap and jackknife techniques
   e. Difference equations and iterative solutions
   f. Bayesian estimation

3. Statistical inference in abundance estimation
   a. Interval estimation
   b. Tag loss
   c. Bias correction

4. Design of mark-recapture investigations
   a. Sampling precision and sample size calculations for abundance estimation
   b. Design and analysis of comparative surveys
   c. Design and analysis of field experiments

5. Closed population, multiple mark-recapture studies
   a. Lincoln Index
   b. Schnabel census
   c. Schumacher-Eschmeyer's method

6. Open population, multiple mark-recapture studies
   a. Bailey's triple-catch method
   b. Manly-Parr method
   c. Jolly-Seber model
   d. GLM analysis

7. Survival estimation
   a. Radiotelemetry analysis
   b. Release-recovery methods – Brownie models
   c. Release-recapture methods – Cormack model
   d. Multistate models
   e. Cohort and individual covariates

8. Catch-effort analysis
   a. Constant effort, closed population method – Zippin model
   b. Variable effort, closed population method – Leslie, DeLury methods

c. Variable effort, open population methods

9. Tag-release studies
   a. Continuous sampling models
   b. CWT - analysis

10. Density estimation
    a. Mark-recapture analysis
    b. Line-transect methods
    c. Program DISTANCE